Fok, M. L. Y., Chang, C. K., Broadbent, M., Stewart, R., & Moran, P. (2019). General hospital admission rates in people diagnosed with personality disorder. *Acta Psychiatrica Scandinavica*, *139*(3), 248-255. https://doi.org/10.1111/acps.13004

Acta Psychiatrica Scandinavica

General hospital admission rates in people diagnosed with personality disorder

Journal:	*Acta Psychiatrica Scandinavica*
Manuscript ID	ACP-2018-7680.R1
Manuscript Type:	Original Article
Date Submitted by the Author:	10-Dec-2018
Complete List of Authors:	Fok, Marcella; King's College London Institute of Psychiatry, Psychology and Neuroscience, Dept of Psychological Medicine Chang, Chin-Kuo; Institute of Psychiatry, King's College London, Department of Psychological Medicine Broadbent, Matthew; South London & Maudsley NHS Foundation Trust, Biomedical Research Centre Stewart, Robert; Institute of Psychiatry, Psychological Medicine Moran, Paul; University of Bristol, Centre for Academic Mental Health, School of Social & Community Medicine; University of Bristol
Keywords:	Personality Disorder, Physical illness, Comorbidity, Epidemiology

General hospital admission rates in people diagnosed with personality disorder

Running title: Hospital admissions in people with personality disorder

Marcella Lei-Yee Fok, MD(Res),[1,*] Chin-Kuo Chang, PhD,[1,2,*] Matthew Broadbent, MA,[3] Robert Stewart, MD,[1,3] Paul Moran**, MD [4]

[1] Department of Psychological Medicine, King's College London (Institute of Psychiatry, Psychology, and Neuroscience), UK. e-mails: chin-kuo.chang@kcl.ac.uk for C-KC, robert.stewart@kcl.ac.uk for RS, and marcella.fok@kcl.ac.uk for MF

[2] Department of Health and Welfare, University of Taipei, Taipei City, Taiwan. e-mail: ckchang@utaipei.edu.tw

[3] South London and Maudsley NHS Foundation Trust, Denmark Hill, London, UK. e-mail: matthew.broadbent@slam.nhs.uk

[4] Centre for Academic Mental Health, Department of Population Health Sciences, Bristol Medical School, University of Bristol, Bristol BS8 2BN

paul.moran@bristol.ac.uk

* Drs Marcella Fok and Chin-Kuo Chang equally shared the first authorship of this study.

Corresponding Author: Paul Moran

Conflict of interest: The authors declare no conflict of interest in this research.

ACKNOWLEDGEMENTS

Clinical Record Interactive Search (CRIS) was supported by funding from the National Institute of Health Research (NIHR) Specialist Biomedical Research Centre for Mental Health. PM is part-funded by the NIHR Biomedical Research Centre at University Hospitals Bristol NHS Foundation Trust and the University of Bristol.

ABSTRACT

Objective: To determine the frequency of all-cause general hospital admissions for individuals with personality disorder (PD) in a large clinical population using linked secondary mental healthcare and hospitalisation data.

Method: A retrospective cohort study, using anonymised electronic mental health records from South London and Maudsley NHS Foundation Trust (SLaM), linked to Hospital Episodes Statistics in England. People with PD aged 15 years or older, receiving care within SLaM between April 2007 and March 2013, were identified and compared to residents from the local catchment area. Standardised admission ratios (SARs) were calculated for all major categories of causes of general hospital admission for this defined group, with local residents in 2011 UK Census as the standard population.

Results: For the 7,677 people identified with PD, SAR for all causes of admission was 2.75 (95% CI: 2.70, 2.81). Both men and women with PD had increased SARs across multiple ICD-10 categories, including circulatory, respiratory, digestive, nervous, and musculoskeletal system disorders, and endocrine, blood and infectious disorders. Sensitivity analysis (removing the impact of repeated admissions by same individual for same diagnosis in the same year) yielded similar findings.

Conclusions: ~~The presence of PD is associated with a greater likelihood of hospital admission from a variety of physical causes compared to the general population~~ By comparison with members of the general population, individuals with a diagnosis of personality disorder are at significantly higher risk of hospital admission resulting from a wide range of physical health problems.

Key words: personality disorders; physical illness; morbidity; indirect standardization

SIGNIFICANT OUTCOMES

1. Individuals ~~with~~ diagnosed with PD have nearly three times the number of general hospital admissions for non-psychiatric health conditions, compared to the general population
2. Both men and women with PD have significantly higher rates of hospital admission, across a wide range of physical health disorders

LIMITATIONS

1. We relied on clinical diagnoses of PD, rather than structured interviews and it is possible that our sample included some false positive cases of PD
2. Standardised admission ratios only provide a coarse picture of admissions in a specific study population, without consideration of confounders other than age and ~~gender~~ sex.

INTRODUCTION

Personality disorder is defined as 'an enduring pattern of inner experience and behavior that deviates markedly from the expectations of the individual's culture, is pervasive and inflexible, has onset in adolescence or early adulthood, is stable over time, and leads to distress or impairment' (1). Personality disorder (PD) affects up to 10% of the general population (2), and is associated with considerable burden to individuals, their families and wider society. Individuals with the diagnosis of PD experience significantly poorer general health compared to their counterparts in the general population (3). This exacts a heavy toll over the life course and it has recently been reported that people with diagnosed PD have considerably shortened lives (4, 5) with premature deaths resulting from both natural and unnatural causes (6). Consequently, there is now a growing urgency in recognizing personality disorder as a key public health issue (7).

A number of potential direct and indirect mechanisms explain the increased risk of poor health in people with personality disorder. Personality disorder often co-presents with other psychiatric conditions, such as depression, anxiety, or even psychosis (2, 8); these disorders are in turn associated with poor general health including cardiovascular disease (9), risk of diabetes and increased cancer mortality (10). People with personality difficulties are at increased risk of alcohol and substance use (11), which is linked with health problems. Other lifestyle factors such as diet, exercise, and smoking may also play a role. Self-perception of health (12), access to medical care, help-seeking behavior, and treatment adherence (13, 14) are other factors that may have a bearing on health outcomes in this particular group.

Although a growing pool of studies report associations between PD and a range of physical illnesses (3), to our knowledge, there has not yet been a longitudinal investigation of the associations between PD and the full range of physical disorders responsible for

hospitalisation. Such an investigation is much needed in understanding the use of medical resources in the population beyond mental healthcare (15).

Aims of the Study

The present study, using a database drawn from electronic health records, sets out to fill this gap in the literature by describing the frequency of hospital admissions for all causes amongst people diagnosed with personality disorder~~, using linked secondary mental healthcare and hospitalisation data~~.

METHODS

Settings and study cohort

The South London and Maudsley NHS Foundation Trust (SLaM) is one of the largest mental healthcare providers in Western Europe with a catchment population of approximately 1.36 million residents across four southern London boroughs (i.e. Lewisham, Lambeth, Croydon, and Southwark), according to 2011 UK Census data. SLaM offers a broad range of secondary mental healthcare services covering all age groups, including community services, acute and specialist inpatient services, forensic services, and general hospital liaison services. There are also a number of specialist services provided at tertiary level, which are available to patients beyond its catchment. Since 2006, fully digitalised mental health records have been implemented in all SLaM clinical services. The Clinical Record Interactive Search (CRIS) system was set up to allow investigators to search and retrieve anonymised comprehensive health records for all SLaM service users in 2008 (16). The resulting SLaM Case Register was approved for secondary data analyses of its anonymised health records by the Oxfordshire Research Ethics Committee C with a reference number of 08/H0606/71+5, stringently monitored within a specific patient-led governance framework.

Participants

A CRIS search was conducted to identify people with diagnosed PD, combining two search approaches in order to capture a comprehensive sample. The first approach captured cases based on the clinical diagnosis as per World Health Organization ICD-10 classification codes F60 (specific personality disorders) or F61 (mixed and other personality disorders), ever recorded as a primary or secondary diagnosis within a structured diagnosis field ~~before the end of the observation period (31 March, 2013)~~. The second approach used natural language

processing software, Generalised Architecture for Text Engineering (GATE), to detect any personality disorder diagnoses documented in open-text fields of case notes and in correspondence letters to/from GPs and other agencies. In simple terms, GATE software is specially programmed to 'read' the free-text within the electronic health record and identify instances when a personality disorder diagnosis has been made, for example within a report or a letter. The development of GATE natural language processing in CRIS and its uses have been described in a peer-reviewed open access publication (16). The validity of personality disorder diagnoses found by GATE have previously been examined and found to be satisfactory (17). All cases identified were at least 15 years old at the mid-point of the observation period (1 April, 2007 - 31 Mar, 2013), resided within the SLaM catchment area, and had received SLaM assessment or treatment within the period. For descriptive purposes, basic demographic information, including gender, ethnicity and marital status, are obtained from routinely completed fields in the source records. The individual's residential postcode was used to obtain an index of multiple deprivation score, which is a proxy for socioeconomic status (18).

Hospital Episodes Statistics (HES) data contains details of all admissions to National Health Service (NHS) hospitals in England and Wales. A linkage between CRIS and HES datasets, generated by the NHS Health and Social Care Information Centre (now NHS Digital), contains details of all admissions to hospitals in England and Wales for people who are resident in the SLaM catchment area, along with a link variable ascertaining their CRIS record, for those who have received SLaM care. Hospital admissions recorded in HES data have associated primary discharge diagnoses in ICD-10 categories, which are given in a structured field in the electronic record as part of clinical routine in all admissions. In this study, hospitalisation episodes were restricted to admissions to general (rather than mental

health) inpatient units, and we investigated all primary discharge diagnoses apart from those indicating mental and behavioural disorders (Chapter V or F00-F99 codes) because patterns of co-morbidity between PD and other mental disorders have already been extensively characterised (19-21).

Statistical analysis

Standardised Admission Ratios

Standardised admission ratios (SARs) were calculated for people with PD, with adjustment of for age, gender, and fiscal year of admission. Age-and-gender structure was derived from the 2011 UK Census for the catchment population in order to calculate expected admission numbers. SARs were calculated for all primary discharge diagnosis groups, apart from those recording mental disorders, in the observation period ~~from 1st April 2007 to 31st March 2013~~. The denominator was the expected number of admissions estimated by age-, gender-, and admission fiscal year-specific (i.e. the year running from 1st April to 31st March) admission rates for the local population, multiplied by the age and gender structure in the same catchment area given by the 2011 UK Census data. Each age stratum was defined at the mid-point of the observation period and divided into 5-year age groups (from 15-19 to 90+). Following this, gender-stratified SARs were calculated separately for all the major diagnosis chapters of ICD-10.

To assess the potential impact of individuals having repeat admissions to hospital for the same cause, we undertook a sensitivity analyses on the same dataset (N=7,677), in which individuals who experienced repeated admissions in a single fiscal year with the same ICD-10 discharge diagnosis were counted only once in that year.

Further, in order to investigate whether specific subtypes of personality disorder were associated with hospitalization, we calculated and compared all cause standardized admission ratios (excepting mental and behavior disorders in ICD Chapter V) for groups of patients with specific cluster A personality disorder (schizoid and paranoid), cluster B personality disorder (emotionally unstable, histrionic, and dissocial), and cluster C personality disorder (anxious (avoidant), dependent, and anankastic).

All analyses were performed using Stata software version 12.0. The alpha level was set at 0.05 as the benchmark of statistical significance.

RESULTS

Within the 6-year observation period, there were more than 305,000 service users whose records were contained in CRIS at the point of data retrieval. From these, a total of 7,677 people ~~were given~~ had a diagnosis of PD and were aged at least 15 years old at the mid-point. ~~, 3,384 (44.1%) of whom were male.~~ Table 1 shows the descriptive statistics for this cohort. The mean age was 36.3 years; 4,279 (55.75%) of the cohort were female; about one third were identified by non-white ethnicity; and 10.6% of the cohort were of cohabiting, married, or in civil partnership status. The mean deprivation in area of residence, a proxy for socioeconomic status, is in the 31st percentile nationwide. In terms of specific cluster of personality disorder, the proportions of individuals in the cohort who had received a cluster A, cluster B and cluster C diagnosis (not mutually exclusive) were 7.15%, 62.25%, and 5.05% respectively.~~Figure 1 displays the processes of identification of study subjects and the assembling of comparison groups.~~

Standardised Admission Ratios for All Causes ~~Diseases~~

Table 2~~1~~ displays the full range of standardised admission ratios, by ICD-10 group for people with PD in Southeast London.

Among the PD cohort, a total of 11,213 admission episodes were identified for all non-psychiatric causes during the observation window, showing an overall elevated frequency of all-cause admission (age-, gender, and year-standardized admission ratio, SAR = 2.75; 95% CI: 2.70, 2.81). Stratification by gender ~~shows~~ revealed that men with PD had an overall SAR (3.57; 95% CI: 3.46, 3.68) that was ~~slightly~~ higher than the overall SAR for women with diagnosed PD (2.44; 95% CI: 2.39, 2.50), although the female group accounted for a greater number of hospital admissions (7,195 admissions for females vs. 4,018 for males). Of all the included ICD chapters, neoplasms (C00-D48) and congenital abnormalities (Q00-Q99) were the only two categories of hospital admission for which SARs among the PD cohort were comparable with those for the general population. The SAR for genitourinary systems: pelvis, genitals and breasts (N40-N99) was elevated, but not to the level of statistical significance. Admissions for poisoning and other external causes (ICD-10 codes T15-T98) had the highest SARs (SAR = 14.44; 95% CI: 13.76, 15.15 for both genders combined). Across all the ICD chapters for physical diseases (i.e. Chapters A to Q inclusive), excepting neoplasms, congenital abnormalities, genitourinary system (pelvis, genitals and breasts; N40-N99), and pregnancy related disorders, SARs ranged from 1.80 to 5.31, and were all elevated to the level of statistical significance. The sensitivity analysis, removing repeated admissions for same diagnosis by same individuals within a fiscal year, yielded very similar results (Supplement Table 1).

Standardised Admission Ratios for All Causes, by Personality Disorder Cluster

Table 3 displays the age-, gender, and year-standardised admission ratios for all causes of admission for people with cluster A, cluster B and cluster B personality disorder. The cluster B group was the largest group, with 4,776 individuals and accounted for over 6,000 admissions in the period. Frequencies of hospital admission were elevated across all three clusters (age-, gender, and year-standardized admission ratio for cluster A group SAR = 1.94; 95% CI: 1.78, 2.12; cluster B group SAR = 2.33; 95% CI: 2.27, 2.38; cluster C group SAR = 2.55; 95% CI: 2.33, 2.78). In all three cluster groups, stratification by gender shows that men had SAR that were slightly higher than those of women in the same cluster group.

DISCUSSION

In this study of a large clinical cohort of individuals diagnosed with PD, we found that the number of general hospital admissions, excluding those for mental health conditions, was almost three times higher than that expected. This included hospital admissions for diseases of all the major body systems – circulatory, respiratory, digestive, musculoskeletal, nervous, and endocrine. This indicates that as a group, individuals diagnosed with PD are at significantly higher risk of being admitted to general hospitals for a range of medical conditions. This higher risk applies to both men and women with diagnosed PD, and extends even to conditions under those miscellaneous ICD chapters (R00-R99, Z00-Z99) where the presentation or admission is not attributed to an identified organic cause. With respect to PD Clusters, we found that all three clusters (A, B and C) were associated with higher rates of

hospital admissions; individuals with clusters B and C PD had a slightly higher risk than individuals with cluster A PD, but there was little difference in the magnitude of elevated risk between these two groups.

Two review papers have summarised the recent empirical research and advances in our understanding of the link between personality disorders and physical health.~~Previous research has reported on the link between PD and physical health problems~~ (3, 15).~~,~~ In population-based studies, PDs (identified by interviewer rating or PD screening items) were associated with higher rates of physical illnesses, and having multiple illnesses. There is also evidence of greater rates of health concerns with specific PDs or PD Clusters. In the Geelong Osteoporosis Study, Cluster B PD was linked with higher odds of syncope, seizures, and arthritis, Cluster A PD was linked to gastroesophageal reflux disease, and Cluster C PD was linked to recurrent headaches. In the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) study, borderline PD were associated with increased gastrointestinal, cardiovascular, and hepatic, or 'any' other disease, hypertension, and arthritis; antisocial PD was associated with elevated prevalence of cardiovascular, hepatic, gastrointestinal and arthritic diseases. These findings remain after controlling for covariates such as medication use and physical activity. Moreover, there is evidence emerging from longitudinal studies the PD confers a long-term health risk, with one study showing that individuals with a PD had a 50% faster annual rate of health decline from adolescence through their mid-30s (22).

~~but t~~To our knowledge, this is the first study to chart associations between PD and the full range of physical diseases leading to hospital admission. Our findings enhance our understanding about the burden of disease associated with personality disorder and highlight

the pressing need for targeted interventions to improve the physical health of this patient group.

Few studies have previously examined the impact of PD on hospital admissions for physical disease. Powers and Oltmanns' study of over 600 adults (aged 55-64 years) found that personality disorder features, specifically borderline features, were predictive of greater healthcare use and prescription medication use, over a 6-month period (23). Whilst that study investigated the impact of PD on secondary physical healthcare, the generalizability of its findings is limited by the fact that the study population was restricted to a middle-aged sample. To our knowledge, our study is the first to examine general hospital admissions amongst all adult-age secondary mental healthcare patients diagnosed with PD. The raised admission rates associated with PD clearly reflect the substantially higher burden of physical health comorbidities experienced by individuals with PD (15, 24-27). Increasingly the body of evidence points towards the occurrence of an accelerated deterioration in the health of individuals with PD over time (28-31) although the reasons remain unclear. A number of biological, environmental, and psychological/behavioural factors may be implicated. Biological vulnerabilities, including an elevated risk of obesity (32) and metabolic syndrome (33) almost certainly contribute to the raised risk of cardiovascular disease (34). Obesity and metabolic syndrome may be caused by lifestyle, health behaviours (such as disordered eating, lack of exercise, substance use) as well as prescribed medication; a raised BMI is also linked to other health problems such as arthritis. For some individuals with PD, where emotional dysregulation is a key feature, emotional instability may play a mediating role in the development of poor health – as shown by Gratz et al's prospective study of borderline PD symptoms and later physical health symptoms (35). Difficulties with emotional regulation may increase susceptibility to dysfunctional stress response and development of disease

states; demonstrable physiological indices include hyperactivity of the hypothalamic-pituitary-adrenal axis (36), immune system dysfunction (37) , increased risk of inflammation (38). Under-treatment, poor compliance with treatment of medical conditions, the absence or poverty of support network, as well as poor access to appropriate medical care (including primary care services), may also contribute to poor health and increased hospitalisation rates.

Given the wide range ~~spread~~ of conditions for which admission rates were ~~are~~ raised, the question arises as to why admissions for cancer ~~are~~ were not also elevated ~~raised~~ in this cohort. Studies have found that cancer incidence in psychiatric populations is comparable to the general population, but case fatality is higher, probably due to people with mental disorders presenting later (so disease is more advanced or cancer more likely to have metastasized at diagnosis) and receiving fewer specialised interventions (39, 40).

Strengths and limitations

We identified a sizeable cohort of over 7,600 patients with clinically diagnosed personality disorder, with a 6-year observation window for general hospital admissions, providing excellent statistical power and precision to our findings across all the major ICD-10 categories of medical conditions. We were able to examine rates of overall admission by personality disorder cluster, although there was insufficient power to look at individual categories of medical conditions by PD cluster. Yet the findings need to be considered in the light of certain limitations. We relied on clinical diagnoses of PD, rather than structured interviews; neither method is necessarily superior and in both it is possible~~that our sample included~~ to generate ~~some~~ false positive cases of PD, thus potentially diluting associations. It is also possible that false negatives, i.e. people with undiagnosed personality disorder exist in

the general population comparator group, constituting misclassification; any bias arising from this would likely reduce, rather than accentuate, the magnitude of our findings. The fact that PD diagnoses were made during the same time as the hospitalisations were estimated, introduces the possibility of bias – individuals who present more to hospital for a physical disorder may, in principle, be more likely to attract a psychiatric diagnosis or personality disorder diagnosis. Furthermore, standardised admission ratios only provide a coarse picture of admissions in a specific study population, without consideration of confounders other than age, gender, and period. The use of routinely collected clinical data meant that a number of key confounding variables were unavailable and could not be accounted for, such as lifestyle factors (smoking, drug and alcohol intake, physical activity, obesity) and ~~,~~ psychiatric comorbidity~~, and subtype of PD~~. Although the role of psychiatric comorbidity in PD was beyond the scope of this study, individuals with diagnosed PD in the sample were likely to have co-morbid psychiatric conditions, and these co-morbid conditions may well account for some of the elevated risk of hospitalisation for physical disorders. Physical health conditions that are directly related to alcohol and other substance use, may be classified by an ICD-10 F code (under F10-F19 Mental and behavioural disorders due to psychoactive substance use) and thus would not have been included in our data, because we excluded all F-code diagnosis admissions. Furthermore, important information on length of stay and associated economic costs, and ~~an individual's~~ engagement with healthcare and attitudes to primary care versus hospital care, were not covered in our study, but nevertheless ~~could be~~are relevant in the association between PD and hospital admission.

We conclude that people with personality disorder experience ~~have~~ an excess frequency of general hospital admission compared to the general population, for all types of physical health conditions, except neoplasms and congenital abnormalities. These findings highlight

the burden of physical morbidity and general hospital service use amongst people with PD, as well as the healthcare costs incurred by this population. Further research is needed to quantify the size of excess costs and also to determine why people with PD experience such a wide range of physical disease. In parallel, we urgently need to renew effort to ensure that people with PD receive parity of care around the assessment of their physical health needs (41).

REFERENCES

1. Association AP. Diagnostic and statistical manual of mental disorders 5th ed. Arlington, VA: American Psychiatric Publishing; 2013.

2. Samuels J. Personality disorders: epidemiology and public health issues. Int Rev Psychiatry. 2011;23(3):223-33.

3. Dixon-Gordon KL, Conkey LC, Whalen DJ. Recent advances in understanding physical health problems in personality disorders. Curr Opin Psychol. 2017;21:1-5.

4. Fok ML, Hayes RD, Chang CK, Stewart R, Callard FJ, Moran P. Life expectancy at birth and all-cause mortality among people with personality disorder. Journal of Psychosomatic Research. 2012;73(2):104-7.

5. Bjorkenstam E, Bjorkenstam C, Holm H, Gerdin B, Ekselius L. Excess cause-specific mortality in in-patient-treated individuals with personality disorder: 25-year nationwide population-based study. Br J Psychiatry. 2015;207(4):339-45.

6. Nordentoft M, Wahlbeck K, Hallgren J, Westman J, Osby U, Alinaghizadeh H, et al. Excess Mortality, Causes of Death and Life Expectancy in 270,770 Patients with Recent Onset of Mental Disorders in Denmark, Finland and Sweden. PLoS ONE. 2013;8(1).

7. Easton M. Personality disorder patients 'let down' by the system. http://www.bbc.co.uk/news/health-42647972: BBC News; 2018.

8. Zimmerman M, Rothschild L, Chelminski I. The prevalence of DSM-IV personality disorders in psychiatric outpatients. American Journal of Psychiatry. 2005;162(10):1911-8.

9. Lichtman JH, Froelicher ES, Blumenthal JA, Carney RM, Doering LV, Frasure-Smith N, et al. Depression as a Risk Factor for Poor Prognosis Among Patients With Acute Coronary Syndrome: Systematic Review and Recommendations: A Scientific Statement From the American Heart Association. Circulation. 2014.

10. Commission TS. The abandoned illness: a report from the Schizophrenia Commission. 2012.

11. Grant BF, Stinson FS, Dawson DA, Chou SP, Ruan WJ, Pickering RP. Co-occurrence of 12-Month Alcohol and Drug Use Disorders and Personality Disorders in the United States: Results From the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry. 2004;61(4):361-8.

12. Goodwin R, Engstrom G. Personality and the perception of health in the general population. Psychological Medicine. 2002;32(2):325-32.

13. Jackson HJ, Burgess PM. Personality disorders in the community: results from the Australian National Survey of Mental Health and Well-being Part III. Relationships between specific type of personality disorder, Axis 1 mental disorders and physical conditions with disability and health consultations. Soc Psychiatry Psychiatr Epidemiol. 2004;39(10):765-76.

14. Powers A, Strube MJ, Oltmanns TF. Personality pathology and increased use of medical resources in later adulthood. Am J Geriatr Psychiatry. 2014;22(12):1478-86.

15. Quirk SE, Berk M, Chanen AM, Koivumaa-Honkanen H, Brennan-Olsen SL, Pasco JA, et al. Population Prevalence of Personality Disorder and Associations With Physical Health Comorbidities and Health Care Service Utilization: A Review. Personal Disord. 2015.

16. Perera G, Broadbent M, Callard F, Chang CK, Downs J, Dutta R, et al. Cohort profile of the South London and Maudsley NHS Foundation Trust Biomedical Research Centre (SLaM BRC) Case Register: current status and recent enhancement of an Electronic Mental Health Record-derived data resource. BMJ Open. 2016;6(3):e008721.

17. Fok ML, Stewart R, Hayes RD, Moran P. The impact of co-morbid personality disorder on use of psychiatric services and involuntary hospitalization in people with severe mental illness. Soc Psychiatry Psychiatr Epidemiol. 2014;49(10):1631-40.

18. Noble M, McLennan D, Wilkinson K, Whitworth A, Barnes H, Dibben C. The English indices of deprivation 2007. In: London Calg, editor. 2008.

19. McGlashan TH, Grilo CM, Skodol AE, Gunderson JG, Shea MT, Morey LC, et al. The Collaborative Longitudinal Personality Disorders Study: baseline Axis I/II and II/II diagnostic co-occurrence. Acta Psychiatrica Scandinavica. 2000;102(4):256-64.

20. Newton-Howes G, Tyrer P, Anagnostakis K, Cooper S, Bowden-Jones O, Weaver T. The prevalence of personality disorder, its comorbidity with mental state disorders, and its clinical significance in community mental health teams. Soc Psychiatry Psychiatr Epidemiol. 2010;45(4):453-60.

21. Friborg O, Martinsen EW, Martinussen M, Kaiser S, Overgard KT, Rosenvinge JH. Comorbidity of personality disorders in mood disorders: a meta-analytic review of 122 studies from 1988 to 2010. J Affect Disord. 2014;152-154:1-11.

22. Chen H, Cohen P, Crawford TN, Kasen S, Guan B, Gorden K. Impact of early adolescent psychiatric and personality disorder on long-term physical health: a 20-year longitudinal follow-up study. Psychol Med. 2009;39(5):865-74.

23. Powers AD, Oltmanns TF. Personality Disorders and Physical Health: A Longitudinal Examination of Physical Functioning, Healthcare Utilization, and Health-Related Behaviors in Middle-Aged Adults. Journal of Personality Disorders. 2012;26(4):524-38.

24. Quirk SE, Stuart AL, Brennan-Olsen SL, Pasco JA, Berk M, Chanen AM, et al. Physical health comorbidities in women with personality disorder: Data from the Geelong Osteoporosis Study. Eur Psychiatry. 2016;34:29-35.

25. Jackson HJ, Burgess PM. Personality disorders in the community: results from the Australian National Survey of Mental Health and Wellbeing Part II. Relationships between personality disorder, Axis I mental disorders and physical conditions with disability and health consultations. Social Psychiatry and Psychiatric Epidemiology. 2002;37(6):251-60.

26. Fok M, Hotopf M, Stewart R, Hatch S, Hayes R, Moran P. Personality disorder and self-rated health: a population-based cross-sectional survey. Journal of Personality Disorders. 2014;28(3):319-33.

27. El-Gabalawy R, Katz LY, Sareen J. Comorbidity and Associated Severity of Borderline Personality Disorder and Physical Health Conditions in a Nationally Representative Sample. Psychosomatic Medicine. 2010;72(7):641-7.

28. Moran P, Romaniuk H, Coffey C, Chanen A, Degenhardt L, Borschmann R, et al. The influence of personality disorder on the future mental health and social adjustment of young adults: a population-based, longitudinal cohort study. Lancet Psychiatry. 2016;3(7):636-45.

29. Hudson C, Spry E, Borschmann R, Becker D, Moran P, Olsson C, et al. Preconception personality disorder and antenatal maternal mental health: A population-based cohort study. J Affect Disord. 2017;209:169-76.

30. Chen H, Cohen P, Kasen S, Johnson JG. Adolescent axis I and personality disorders predict quality of life during young adulthood. Journal of Adolescent Health. 2006;39(1):14-9.

31. Cohen P, Chen H, Crawford TN, Brook JS, Gordon K. Personality disorders in early adolescence and the development of later substance use disorders in the general population. Drug and Alcohol Dependence. 2007;88:S71-S84.

32. Gerlach G, Loeber S, Herpertz S. Personality disorders and obesity: a systematic review. Obes Rev. 2016;17(8):691-723.

33. Kahl KG, Greggersen W, Schweiger U, Cordes J, Correll CU, Frieling H, et al. Prevalence of the metabolic syndrome in patients with borderline personality disorder: results from a cross-sectional study. Eur Arch Psychiatry Clin Neurosci. 2013;263(3):205-13.

34. Moran P, Stewart R, Brugha T, Bebbington P, Bhugra D, Jenkins R, et al. Personality disorder and cardiovascular disease: results from a national household survey. Journal of Clinical Psychiatry. 2007;68(1):69-74.

35. Gratz KL, Weiss NH, McDermott MJ, Dilillo D, Messman-Moore T, Tull MT. Emotion Dysregulation Mediates the Relation Between Borderline Personality Disorder Symptoms and Later Physical Health Symptoms. J Pers Disord. 2017;31(4):433-48.

36. Wingenfeld K, Spitzer C, Rullkotter N, Lowe B. Borderline personality disorder: hypothalamus pituitary adrenal axis and findings from neuroimaging studies. Psychoneuroendocrinology. 2010;35(1):154-70.

37. Glaser R, Kiecolt-Glaser JK. Stress-induced immune dysfunction: implications for health. Nat Rev Immunol. 2005;5(3):243-51.

38. Appleton AA, Buka SL, Loucks EB, Gilman SE, Kubzansky LD. Divergent associations of adaptive and maladaptive emotion regulation strategies with inflammation. Health Psychol. 2013;32(7):748-56.

39. Guan NC, Termorshuizen F, Laan W, Smeets HM, Zainal NZ, Kahn RS, et al. Cancer mortality in patients with psychiatric diagnoses: a higher hazard of cancer death does not lead to a higher cumulative risk of dying from cancer. Social Psychiatry and Psychiatric Epidemiology. 2013;48(8):1289-95.

40. Kisely S, Crowe E, Lawrence D. Cancer-related mortality in people with mental illness. JAMA Psychiatry. 2013;70(2):209-17.

41. Sanatinia R, Middleton SM, Lin T, Dale O, Crawford MJ. Quality of physical health care among patients with personality disorder. Personality and Mental Health. 2015;9(4):319-29.

Table 1. Descriptive statistics for people with personality disorder (PD) in South London and Maudsley NHS Foundation Trust (1st April 2007 – 31st March 2013) (N=7,677)

Variables	Mean ± SD / Number (%)
Age at mid-window (years old)	36.32 ± 14.69
Gender	
Female	4,279 (55.74)
Male	3,384 (44.08)
Unknown / missing	14 (0.18)
Ethnicity	
White	5,198 (67.71)
Black	1,307 (17.02)
South Asian	132 (1.72)
East Asian	141 (1.84)
Others / mixed / unknown	854 (11.71)
Marital status	
Married / Civil Partner / Cohabiting	811 (10.56)
Single	5,553 (72.33)
Divorced / separated	800 (10.42)
Widowed	124 (1.62)
Others / unknown / missing	389 (5.07)
Multiple deprivation score (in percentile)	31.06 ± 9.33
PD diagnosis identified by natural language processing	
No	1,434 (18.68)
Yes	6,243 (81.32)

PD diagnosis given by ICD-10 codes F60-61 in structured field	
No	2,676 (34.86)
Yes	5,001 (65.14)
Ever been given a PD cluster A diagnosis[1]	
No	7,128 (92.85)
Yes	549 (7.15)
Ever been given a PD cluster B diagnosis[1]	
No	2,898 (37.75)
Yes	4,779 (62.25)
Ever been given a PD cluster C diagnosis[1]	
No	7,289 (94.95)
Yes	388 (5.05)

[1] Based on personality disorder diagnosis in clinical records, where this corresponds to a diagnosis in Cluster A, B or C. The three groups are not mutually exclusive as some subjects have more than one diagnosis. A number of subjects have a personality disorder diagnosis that is not classifiable within the three clusters, e.g. Personality disorder, unspecified

Table 2. Age-, gender, and year-standardised admission ratios by ICD-10 diagnosis groups for people with personality disorder in Southeast London (1st April 2007 – 31st March 2013) [a]

	Total	Male	Female
Number of people with personality disorder	7,677[b]	3,384	4,279
	Standardised Admission Ratios (95% CI; number of admissions)		
Diagnosis in ICD-10	Total	Male	Female
All causes of admission	2.75 (2.70, 2.81; n=11,213)*	3.57 (3.46, 3.68; n=4,018)*	2.44 (2.39, 2.50; n=7,195)*
Infectious diseases (A00-B99)	2.35 (1.97, 2.77; n=140)*	2.39 (1.86, 3.02; n=69)*	2.30 (1.80, 2.91; n=71)*
Neoplasms (C00-D48)	0.95 (0.81, 1.09; n=182)	0.92 (0.70, 1.19; n=59)	0.96 (0.80, 1.14; n=123)
Blood disorders (D50-D89)	4.12 (3.67, 4.61; n=303)*	4.00 (3.29, 4.81; n=113)*	4.20 (3.62, 4.84; n=190)*
Endocrine and metabolic diseases (E00-E90)	4.41 (3.95, 4.91; n=338)*	4.43 (3.71, 5.26; n=131)*	4.40 (3.82, 5.04; n=207)*
Nervous system (G00-G99)	4.17 (3.75, 4.61; n=370)*	3.16 (2.65, 3.75; n=134)*	5.08 (4.45, 5.77; n=236)*
Eye conditions (H00-H59)	1.92 (1.15, 3.00; n=19)*	0.91 (0.25, 2.34; n=4)	2.72 (1.52, 4.48; n=15)*
Ear conditions (H60-H95)	2.35 (1.57, 3.37; n=29)*	1.88 (0.90, 3.45; n=10)	2.70 (1.63, 4.22; n=19)*
Circulatory system (I00-I99)	3.08 (2.83, 2.35; n=547)*	2.80 (2.50, 3.12; n=315)*	3.57 (3.12, 4.06; n=232)*
Respiratory system (J00-J99)	5.31 (4.98, 5.65; n=975)*	4.56 (4.12, 5.04; n=388)*	5.95 (5.48, 6.45; n=587)*
Digestive system (K00-K93)	3.21 (3.01, 3.41; n=984)*	3.09 (2.81, 3.39; n=447)*	3.31 (3.03, 3.60; n=537)*
Skin conditions (L00-L99)	3.60 (3.17, 4.07; n=253)*	3.29 (2.75, 3.92; n=127)*	3.98 (3.31, 4.74; n=126)*
Musculoskeletal system (M00-M99)	2.98 (2.72, 3.26; n=475)*	2.67 (2.31, 3.07; n=198)*	3.25 (2.88, 3.65; n=277)*
Genitourinary system: urinary conditions (N00-N39)	1.80 (1.62, 1.99; n=373)*	1.19 (0.99, 1.41; n=132)	2.50 (2.19, 2.83; n=241)*
Genitourinary system: pelvis, genitals and breasts (N40-N99)	1.15 (1.01, 1.31; n=239)	2.81 (1.95, 3.90; n=35)*	2.12 (1.83, 2.43; n=204)*
Pregnancy related (O00-O99)	--	--	0.82 (0.78, 0.87; n=1,273)*
Congenital abnormalities (Q00-Q99)	0.79 (0.39, 1.42; n=11)	0.35 (0.04, 1.28; n=2)	1.09 (0.50, 2.07; n=9)
Symptoms, signs and findings, not elsewhere classified (R00-R99)	4.34 (4.12, 4.58; n=1,412)*	4.04 (3.69, 4.41; n=493)*	4.53 (4.24, 4.83; n=919)*
Injury (S00-T14)	4.13 (3.83, 4.44; n=725)*	3.36 (3.04, 3.70; n=406)*	5.83 (5.21, 6.50; n=319)*
Poisoning and other external causes (T15-T98)	14.44 (13.76, 15.15; n=1,680)*	10.93 (10.01, 11.90; n=525)*	16.92 (15.95, 17.92; n=1,155)*

Factors influencing health status and contact with health services (Z00-Z99)	2.78 (2.49, 3.10; n=326)*	4.76 (3.83, 5.83; n=92)*	2.39 (2.09, 2.72; n=234)*

[a] Standard population: residents in London boroughs of Southwark, Croydon, Lambeth, and Lewisham in 2011 UK Census; adjusting for age, gender, and fiscal year

[b] Fourteen subjects missing for gender

* Statistical significance

Table 3. Age-, gender, and year-standardised admission ratios for all causes of admission for people with cluster A, cluster B and cluster B personality disorder (1st April 2007 – 31st March 2013)

			All causes of admission	
		Number of patients	Number of admissions	Standardised Admission Ratios (95% CI)
Cluster A	Total	549	511	1.94 (1.78 - 2.12)
	Male	365	282	2.14 (1.89 - 2.40)
	Female	184	229	1.76 (1.54 - 2.00)
Cluster B	Total	4,776*	6,273	2.33 (2.27 - 2.38)
	Male	1,704	1,739	3.20 (3.05 - 3.36)
	Female	3,071	4,534	2.11 (2.04 - 2.17)
Cluster C	Total	388*	497	2.55 (2.33 - 2.78)
	Male	198	243	3.26 (2.86 - 3.69)
	Female	189	254	2.11 (1.86 - 2.39)

* includes one person with unknown gender

Supplement Table 1. Standardised admission ratios by major ICD-10 groups for people with personality disorder, with repeating admissions in a fiscal year eliminated (1 April 2007 – 31 March 2013) [a]

	Standardised Admission Ratios (95% CI; number of people with an admission)		
Diagnosis in ICD-10	Total (N=7,677)[b]	Male (n=3,384)	Female (n=4,279)
All diseases	2.53 (2.48, 2.58; n=9,173)*	3.43 (3.31, 3.55; n=3,173)*	2.22 (2.16, 2.28; n=6,000)*
Infectious diseases (A00-B99)	2.33 (1.94, 2.77; n=126)*	2.25 (1.71, 2.90; n=59)*	2.40 (1.86, 3.04; n=67)*
Neoplasms (C00-D48)	1.02 (0.86, 1.20; n=152)	1.17 (0.87, 1.54; n=52)	0.96 (0.78, 1.16; n=100)
Blood disorders (D50-D89)	2.63 (2.16, 3.18; n=108)*	3.08 (2.24, 4.12; n=45)*	2.39 (1.84, 3.06; n=63)*
Endocrine and metabolic diseases (E00-E90)	3.81 (3.35, 4.33; n=241)*	3.69 (2.96, 4.53; n=90)*	3.90 (3.30, 4.57; n=151)*
Nervous system (G00-G99)	4.00 (3.56, 4.48; n=299)*	2.99 (2.45, 3.62; n=106)*	4.90 (4.23, 5.64; n=193)*
Eye conditions (H00-H59)	1.83 (1.07, 2.93; n=17)*	0.72 (0.15, 2.10; n=3)	2.74 (1.50, 4.59; n=14)*
Ear conditions (H60-H95)	2.26 (1.49, 3.28; n=27)*	1.73 (0.79, 3.29; n=9)	2.66 (1.57, 4.20; n=18)*
Circulatory system (I00-I99)	2.89 (2.63, 3.18; n=434)*	2.58 (2.26, 2.92; n=243)*	3.42 (2.96, 3.95; n=191)*
Respiratory system (J00-J99)	4.26 (3.94, 4.60; n=672)*	3.61 (3.18, 4.07; n=263)*	4.82 (4.37, 5.31; n=409)*
Digestive system (K00-K93)	3.04 (2.84, 3.26; n=818)*	2.91 (2.62, 3.22; n=367)*	3.16 (2.87, 3.46; n=451)*
Skin conditions (L00-L99)	3.31 (2.87, 3.78; n=211)*	3.03 (2.48, 3.66; n=106)*	3.64 (2.98, 4.41; n=105)*
Musculoskeletal system (M00-M99)	2.90 (2.63, 3.18; n=435)*	2.57 (2.20, 2.97; n=180)*	3.19 (2.81, 3.61; n=255)*
Genitourinary system: urinary conditions (N00-N39)	2.46 (2.18, 2.75; n=292)*	1.85 (1.49, 2.27; n=92)*	2.89 (2.50, 3.32; n=200)*
Genitourinary system: pelvis, genitals and breasts (N40-N99)	1.93 (1.68, 2.19; n=229)*	0.67 (0.46, 0.93; n=33)*	2.83 (2.45, 3.26; n=196)*
Pregnancy related (O00-O99)	--	--	0.78 (0.73, 0.82; n=1,158)*
Congenital abnormalities (Q00-Q99)	0.79 (0.38, 1.45; n=10)	0.39 (0.05, 1.39; n=2)	1.06 (0.46, 2.10; n=8)
Symptoms, signs and findings, not elsewhere classified (R00-R99)	4.04 (3.81, 4.27; n=1,176)*	3.86 (3.49, 4.25; n=415)*	4.14 (3.85, 4.45; n=761)*
Injury (S00-T14)	4.02 (3.72, 4.33; n=667)*	3.25 (2.92, 3.59; n=370)*	5.70 (5.07, 6.39; n=297)*
Poisoning and other external causes (T15-T98)	13.41 (12.71, 14.14; n=1,372)*	10.21 (9.27, 11.22; n=429)*	15.64 (14.66, 16.67; n=943)*
Factors influencing health status and contact with health services (Z00-Z99)	2.69 (2.39, 3.01; n=300)*	4.36 (3.45, 5.42; n=80)*	2.36 (2.06, 2.69; n=220)*

[a] Standard population: residents in London boroughs of Southwark, Croydon, Lambeth, and Lewisham in 2011 UK Census; adjusting for age, gender, and fiscal year
[b] Fourteen subjects missing for gender
* Statistical significance